REMARKS

A. BACKGROUND

The present Amendment is in response to the Office Action mailed October 30, 2008. Claims 1-17 were pending and rejected in view of cited art.[1] No are cancelled, claims 1, 2, 4-8, and 11-13 are amended, and claims 18-20 are newly added. Claims 1-20 are now pending in view of the above amendments.[2]

Reconsideration of the application is respectfully requested in view of the above amendments to the claims and the following remarks.

Please note that the following remarks are not intended to be an exhaustive enumeration of the distinctions between any cited references and the claimed invention. Rather, the distinctions identified and discussed below are presented solely by way of example to illustrate some of the differences between the claimed invention and the cited references. In addition, Applicant requests that the Examiner carefully review any references discussed below to ensure that Applicant's understanding and discussion of the references, if any, is consistent with the Examiner's understanding.

B. REJECTION UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

The Office Action rejects claims 1, 2, and 4 under 35 U.S.C. § 112, second paragraph, as being allegedly indefinite.

With regards claim 1, the Office Action alleges that a definition of "/" is not provided in the specification. Applicants respectfully traverse this rejection and, as such, it is submitted that the "/" in REVO/S is included to visually separate the active catalyst portion of the claimed catalyst (i.e., REVO) from the support portion (i.e., S). Moreover, Applicants respectfully submit that this is impliedly clear in the structure of the claims, which separate discussion of the "REVO" portion form the discussion of the "S" portion. For example, claim 1 recites, in part, "RE is at least one of the group of rare earth metals Y, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Er and Yb in an amount of up to 6.0 wt.-%; V is vanadium in an amount of 0.2-2.5 wt.-%; O is oxygen in an

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[1] Although the prior art status of the cited art is not being challenged at this time, Applicant reserves the right to challenge the prior art status of the cited art at any appropriate time, should the need arise. Accordingly, any arguments and amendments made herein should not be construed as acquiescing to any prior art status of the cited art.

[2] Support for the claim amendments and/or new claims can be found throughout the specification and drawings as originally filed.

amount of up to 3.5 wt.-%; and S is a support containing TiO_2 in an amount of at least 70 wt.-%, WO_3 in an amount of 5-20 wt.-%, and SiO_2 in an amount of up to 15 wt.-%." As such, it is submitted that a person having ordinary skill would understand that "/" is a separating sign having no specific meaning that needs to be explained. Thus it is requested that "/" should remain in the claims.

With regards to claims 2 and 4, the Office Action alleges that the "particularly one of the group of" or the phrase "particularly in an amount of" renders the claims indefinite. In response, the objected to language has been deleted from claims 2 and 4.

C. PRIOR ART REJECTIONS

I. REJECTION UNDER 35 U.S.C. §102

The Office Action rejected claims 1, 5-7, 10, 11, 14, and 15 under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 4,719,192 (Schneider). Applicants respectfully traverse this rejection in view of the following remarks because Schneider does not teach or suggest each and every element of the rejected claims.

Schneider discloses a catalyst that requires the presence of talc and includes at least one metal selected from the group consisting of titanium, zirconium, vanadium, tungsten, molybdenum and cerium in the form of one or more of their oxides. (Schneider, claim 1) It is respectfully submitted that talc is a mineral composed of hydrated magnesium silicate having the chemical formula $H_2Mg_3(SiO_3)_4$ or $Mg_3Si_4O_{10}(OH)_2$. It is further submitted that the talc in Schneider's catalyst is partially acid activated, which removes some of the magnesium leaving a mixture of SiO_4 and talc, but that the acid activation is not allowed to progress to the point that the crystalline structure of the talc is replaced with an amorphous silicate structure. (Schneider, col. 2, lines 47-63).

In direct contrast to what is disclosed in Schneider, claims 1, 5-7, and the claims that depend thereon require the inclusion of "SiO_2 in an amount of up to 15 wt.-%." Schneider does not teach the inclusion of SiO_2. Moreover, it is also respectfully submitted that the catalyst of Schneider requires Mg in the form of talc. The catalyst claimed in the instant application does not include Mg.

Since Schneider does not teach each and every element of the presently claimed catalyst or a process for producing the catalyst as presently claimed, Applicants respectfully request that the rejection under 35 U.S.C. § 102(b) be withdrawn.

II. Claim Rejections Under 35 U.S.C. § 103(a)

The Office Action rejects claims 2, 3, 8, 9, 16, and 17 under 35 U.S.C. § 103(a) as being unpatentable over Schneider and U.S. Pat. No. 7,037,463 (Woodfield), claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view of U.S. Pat. No. 4,221,768 (Inoue), and claims 12 and 13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schneider in view Woodfield and in further view of Inoue.

a. Claims 2, 3, 8, 9, 16, and 17

Applicants respectfully traverse the rejection of claims 2, 3, 8, 9, 16, and 17 in view of Schneider and Woodfield because the references, either alone or in combination, fail to teach or suggest each and every limitation of the claims, the references teach away from the presently claimed invention, and Applicants respectfully submit that Woodfield is nonanalogous art and, as such, a person of ordinary skill would not look to Woodfield in order to solve problems related to design of catalysts for NO_x conversion.

Applicants respectfully suggest that Schneider and Woodfield, either alone or in combination, fail to render the presently claimed invention obvious because they fail to teach or suggest each and every limitation of the claims. More specifically, the combination of references does not teach or suggest inclusion of SiO_2 in a NO_x reduction catalyst. Claims 1 and 5 upon which claims 2, 3, 8, 9, 16, and 17 depend require the inclusion of "SiO_2 in an amount of up to 15 wt.-%." As discussed in greater detail above, Schneider does not teach the inclusion of SiO_2 in a NO_x reduction catalyst. In addition, Applicants respectfully suggest that the inclusion of Woodfield, which contains no disclosure relevant to inclusion of SiO_2 in a NO_x reduction catalyst, does nothing the cure the deficiencies of Schneider. As such, a person of ordinary skill could not combine Schneider and Woodfield to produce the presently claimed invention.

In addition, Applicants respectfully traverse the rejection of claims 2, 3, 8, 9, 16, and 17 because, in advocating for a critical role for talc in catalytic NO_x conversion, Schneider teaches away from the use of SiO_2. For example, Schneider states "[i]t has been discovered that talc

which is preferably acid-activated, will interact synergistically with other catalytic constituents to obtain catalysts . . . with improved activity" (Schneider, col 2, lines 23-26). From that it is immediately evident that the catalyst of Schneider is based on the use of talc. Moreover, Schneider states that silicates other than talc (e.g., SiO_2) will not provide the "synergistic interaction with the oxidic constituents" of the catalyst and that the catalyst will experience a "steep drop on activity" if the synergistic interaction between the talc and the oxidic constituents is lost (Schneider, col 3, lines 1-7). Thus, Applicants respectfully suggest that a person having ordinary skill in the art would not combine the teachings of Schneider with Woodfield in order to make a catalyst that includes SiO_2 and not talc.

Applicants also respectfully submit that Woodfield is nonanalogous art and, as such, a person of ordinary skill would not look to Woodfield in order to solve problems related to design of catalysts for NO_x conversion. The aim of Woodfield is to find an alloy which improves metallic properties in order to improve the durability of metallic articles that are used under stress. Woodfield discloses a method for producing metallic articles such as gas turbine engine components with enhanced stability and mechanical properties and sufficient environmental resistance so as to prevent premature failure (see, e.g., column 1). Metallic articles according to Woodfield can include titanium-base alloys with certain, defined additive elements, e.g., selected Rare Earth Metals, are recommended to be used with the proviso that at least one additive element is present at a level greater than its room-temperature solid solubility limit in the titanium based alloy(see, e.g., claim 1).

In contrast, the aim of the present invention is to provide a catalyst for NO_x conversion. As such, Applicants respectfully submit a person having ordinary skill in the art would not look to Woodfield in order to make a catalyst for NO_x conversion, nor would a person of ordinary skill be motivated to combine the disclosure of Schneider with Woodfield. It is additionally submitted that Woodfield is not a prior art regarding the present invention and that the Examiner has used hindsight when citing Woodfield.

Since the combination of Schneider and Woodfield (1) does not teach or suggest each and every element of the presently claimed invention, (2) teaches away from the presently claimed invention, and (3) Woodfield is non-analogous art a prima facie case of obviousness has not been established for claims 2, 3, 8, 9, 16, and 17. Thus, Applicant respectfully requests withdrawal of the rejection to claims 2, 3, 8, 9, 16, and 17 under 35 U.S.C § 103(a).

b. Claim 4

Applicants respectfully traverse the rejection of claim 4 in view of Schneider and Inoue because the references teach away from the presently claimed invention.

Applicants respectfully traverse the rejection of claim 4 based on the combination of Schneider and Inoue because the references teach away from a catalyst that includes SiO_2. Claim 4 requires the inclusion of "SiO_2 in an amount of 4-12 wt.-%." As discussed in greater detail above Schneider teaches that talc plays a synergistic role with oxidic components in NO_x conversion catalysts and that the synergistic interaction between the talc and the oxidic components will be lost if other silicates are included in the catalyst. Inoue, on the other hand, does teach the inclusion of SiO_2. Because a combination of Schneider and Inoue inevitably results in a catalyst that includes both talc and SiO_2, which Schneider teaches away from, a person of ordinary skill in the art would not be motivated to combine the teachings of Schneider and Inoue in order to make a NO_x catalyst as presently claimed.

Applicants also respectfully traverse the rejection of claim 4 based on the combination of Schneider and Inoue because the references teach away from a catalyst that includes WO_3. Claim 4 requires the presence of "WO_3 in an amount of 5-20 wt.-%." Applicants respectfully submit that a combination of Schneider and Inoue inevitably results in catalyst that includes WO_3. Inoue, however, teaches away from a NO_x conversion catalyst that includes WO_3. A statement by one of the inventors is submitted herewith as Appendix 1 to show that the WO_3 that is required by the claims of the present invention is critical and that, surprisingly and unexpectedly, inclusion of WO_3 results in higher NO_x conversion rates at all temperatures when compared to catalysts that do not contain WO_3 (see, e.g., Tables 2 and 3 of Appendix 1). In contrast to the claims in the instant Application, Applicants respectfully submit that the teachings of Inoue would dissuade a person of ordinary skill from making a catalyst that includes WO_3 as a critical component. For instance, Example 16 of Table 5 of Inoue shows that a catalyst having 10% WO_3 has a lower NO_x conversion percentage at all temperatures when compared to catalysts containing other metals. In another instance, Example 23 of Table 5 of Inoue shows that a catalyst containing vanadium and WO_3 performed no better than other catalysts containing vanadium in combination with other metals.

Based on these results reported in Inoue, Applicants respectfully submit that a person having ordinary skill in the art would reasonably conclude that WO_3 is either of no value or is detrimental to a NO_x conversion catalyst. Because Inoue teaches away from such a combination, a person of ordinary skill in the art would not be motivated to combine the teaching of Schneider and Inoue in order to make a NO_x catalyst as presently claimed.

Since the combination of Schneider and Inoue teaches away from the presently claimed invention a prima facie case of obviousness has not been established for claim 4. Thus, Applicant respectfully requests withdrawal of the rejection to claim 4 under 35 U.S.C § 103(a).

c. **Claims 12 and 13**

Applicants respectfully traverse the rejection of claims 12 and 13 based on the combination of in view of Schneider, Woodfield, and Inoue for at least the same reasons discussed above with respect to claims 2, 3, 8, 9, 16, and 17 and claim 4. In particular, the combination of Schneider, Woodfield, and Inoue teaches away from the presently claimed invention. For example, a combination of Schneider, Woodfield, and Inoue inevitably results in a catalyst that includes both talc and SiO_2, which Schneider teaches away from. In another example, a combination of Schneider, Woodfield, and Inoue inevitably results in a catalyst that includes WO_3, which Inoue teaches away from. As such applicants respectfully suggest that a person of ordinary skill in the art would not be motivated to combine the teachings of Schneider, Woodfield, and Inoue in order to make a NO_x catalyst as presently claimed.

Since the combination of Schneider, Woodfield, and Inoue teaches away from the presently claimed invention a prima facie case of obviousness has not been established for claim 4. Thus, Applicant respectfully requests withdrawal of the rejection to claim 4 under 35 U.S.C § 103(a).

Conclusion

In the event that the Examiner finds any remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney.

The Commissioner is hereby authorized to charge payment of any of the following fees that may be applicable to this communication, or credit any overpayment, to **Deposit Account No. 23-3178**: (1) any filing fees required under 37 CFR § 1.16; (2) any patent application and reexamination processing fees under 37 CFR § 1.17; and/or (3) any post issuance fees under 37 CFR § 1.20. In addition, if any additional extension of time is required, which has not otherwise been requested, please consider this a petition therefore and charge any additional fees that may be required to **Deposit Account No. 23-3178**.

Dated this 27th day of January, 2009

Respectfully submitted,

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Evidentiary Appendix

The influence of Tungsten on SCR activity in a TiO2-Rare Earth-V- System

I, Prof. Alessandro Trovarelli, one of the inventors of WO 2005/046864, declare that I have undertaken the following experiments showing the significant influence of tungsten in the TiO2-RE-Vanadate system on NOx conversion. For this there were compared 2 tungsten free and 2 tungsten containing materials based on TiO2-RE-Vanadates (RE being Er and Tb).

A) **Preparation of the Tungsten free materials:**

Preparation of TiO2/ 8.41% $ErVO_4$

104.6 mg of ammonium metavanadate were dissolved in 15 ml of oxalic acid 1N. The solution was heated in order to obtain the blue complex $(NH_4)_2[VO(C_2O_4)_2]$ and then 3717.17 mg of Er-acetate solution were added. Moreover, some drops of HNO_3 were added in order to avoid the precipitation of the terbium oxalate. Then, the support [2747.7 mg of TiO_2 (DT 51)] was added. This slurry was brought to dryness under continuous stirring at 80-100°C. Finally, the solid was dried at 120°C overnight and calcined at 650°C for 2 hours, pressed into pellets, crushed and sieved in the range 355-425 µm. Ageing of the sample was carried out in a tubular furnace at a temperature of 750°C for 10 h under air.

Preparation of TiO2/ 8.41% $TbVO_4$

107.7 mg of ammonium metavanadate were dissolved in 15 ml of oxalic acid 1N. The solution was heated in order to obtain the blue complex $(NH_4)_2[VO(C_2O_4)_2]$ and then 417.3 mg of $Tb(NO_3)_3 6H_2O$ were added. Moreover, some drops of HNO_3 were added in order to avoid the precipitation of the terbium oxalate. Then, the support [2747.7 mg of TiO_2 (DT 51)] was added. This slurry was brought to dryness under continuous stirring at 80-100°C. Finally, the solid was dried at 120°C overnight and calcined at 650°C for 2 hours, pressed into pellets, crushed and sieved in the range 355-425 µm. Ageing of the sample was carried out in a tubular furnace at a temperature of 750°C for 10 h under air.

B) Preparation of Tungsten containing materials:

Preparation of TiO2/WO3/ 8.41% $ErVO_4$ (corresponds to 5 % Er and 1,5 % V)

This material was prepared accoding to example 17 of WO 05/046864.

Preparation of TiO2/ 8.41% $TbVO_4$

This material was prepared accoding to example 18 of WO 05/046864.

Catalyst testing was carried out in the apparatus described in WO 05/046864. The gas feed consisted of NH_3/N_2, NO/N_2, O_2, N_2. Mass flow meters were used to measure and control the single gaseous stream while an injection pump was used to introduce water. The feed stream was preheated and premixed and ammonia was added to the gaseous mixture immediately before entering the reactor to avoid side reactions. A tubular quartz reactor was employed inserted in a furnace. Temperature was controlled by a thermocouple inserted in the catalyst bed. The gas exiting the reactor was scrubbed with an aqueous solution of phosphoric acid to trap unconverted ammonia and then cooled to condense water vapor. Activity of the catalysts were measured under stationary conditions in a temperature range of 250°C to 450°C. Unless otherwise reported the standard gas composition and reaction conditions given in Table 1 were used. Conditions were selected in order to have a conversion not exceeding ca. 90% with reference catalyst. Gas composition analysis was carried out with an FTIR spectrometer equipped with a gas cell.

Results and conclusion:

The tungsten free catalysts show significant lower activity and particularly a drop in catalytic activity after thermal treatments, in contrast to what was found for the WO3 containing materials (compare examples 17, 17a and 18, 18a in table 2 and Table 3).

These results clearly show that WO_3 plays a significant role in increasing the activity and thermal stability of these catalysts.

Table 1: Reaction conditions and gas composition.

Catalyst weight	100,0 mg
Particle size	350-425 µm
Total flow	0,3 l/min
Temperature	250-450°C
NO conc.	200 ppm
NH3 conc.	240 ppm
O2 conc.	20000 ppm
H2O conc.	10%
N2 conc.	balance

*Table 2: Activity (NOx conversion in %) of **tungsten free catalysts**, fresh and aged catalysts containing RE and V and TiO2.*

Example Nr	RE	RE [%]	V [%]	250°C fresh	320°C fresh	450°C fresh	250°C aged	320°C aged	450°C aged
17a	Er	4,6	1,7	31	66	20	0	9	6
18a	Tb	4,6	1,7	28	60	21	10	21	0

*Table 3: Activity (NOx conversion in %) of **tungsten containing catalysts**, fresh and aged catalysts containing RE and V and WO3 and TiO2 (WO3 : TiO2 =10:90).*

Example Nr	RE	RE [%]	V [%]	250°C fresh	320°C fresh	450°C fresh	250°C aged	320°C aged	450°C aged
17	Er	4,6	1,7	58	81	46	17	46	9
18	Tb	4,6	1,7	62	88	48	25	48	29

Prof. Alessandro Trovarelli